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SCIENCE

A. PROGRAM RATIONALE AND PHILOSOPHY

Children enter this world with a limitless curiosity about their surroundings and the phenomena that they encounter. Shortly after birth they begin a process of inquiry and problem solving aimed at ordering and understanding their world. Science in the elementary school years should aim to retain and nurture this initial curiosity and promote a sense of wonderment and joy as children explore their world.

Science programs for children in the elementary years form the foundation for later science learning. The elements of basic scientific literacy are formed during these years and go far beyond the sole knowledge of scientific facts. The primary goal of science programs must be to produce scientifically literate citizens who are knowledgeable about the world in which they live, skillful in organizing their search for further understanding, and thoughtful in their use of the skills and knowledge that they possess.

A science curriculum that is to achieve the goal of a scientifically literate citizenry is one which has children participating and reflecting on the meaning of what they are doing. Each child brings to each learning situation a considerable and varied background of experience that has an important influence on the construction of personal and relevant meanings. These meanings make sense to the child, have guided them in the past and will be abandoned only with great reluctance. **Children should be**

encouraged to challenge their existing conceptualizations and then, if they are found to be inadequate, to change them, modify them, or replace them with entirely new ones. In order to make changes, the child must be personally involved in science activity and discovery. It is not enough for the student to read about science or to observe the science of others.

The ideas which children hold about the natural world are often referred to as *children's science*. These understandings are often scientifically naive and are often contradictory to the views of the scientific establishment. Children's science is, therefore, simplistic in nature but very powerful for children because it allows them to answer "why does . . .?" or "what will happen if . . .?" The aim of the elementary program is to move children toward attaining the understandings of *scientist's science*. Scientist's science fulfills the requirements and principles of the modern scientific endeavour, recognizing that scientific concepts are tentative in nature and must be constantly subjected to the challenge of new evidence.

Not all science topics are suitable for children in the elementary grades because many require a degree of abstract thought that makes them more suitable for the junior and senior high school years.

B. GENERAL LEARNER EXPECTATIONS

The general learner expectations provide the focus for children's science learning in the elementary years. They are to be developed throughout the program as a whole with specific emphasis that will be indicated for each of the units or topics of study.

The units listed for each grade level will have either a science or a technology emphasis. General learner expectations regarding concepts, skills and attitudes are listed for each of these areas of emphasis. The development of concepts will occur within this context. The specific concepts to be learned will be identified within each of the individual units.

Science inquiry and technology problem solving skills are to be developed in connection with the activities associated with the units at each grade level. These skills are organized under the common headings of Focus, Plan, Action and Evaluation. The intention is that students will have a shared framework for solving problems, whether they are in the area of science inquiry or technology problem solving. The possibilities for enhancing specific skills will be outlined with each unit.

The attitudes described in this section are general in nature and refer to the program as a whole. Opportunities will exist to develop particular attitudes in connection with the individual units of study. These opportunities will be indicated in the outlines for each of the units.

SCIENCE EMPHASIS

CONCEPTS

Students will develop an understanding that:

1. science provides a way to investigate and learn about phenomena encountered in daily life
2. science knowledge should be open to further investigation

3. knowledge changes over time.

SCIENCE INQUIRY SKILLS

Focus of Inquiry

Students will:

1. identify what they want to know or find out
2. identify possible answers to their own questions (hypothesize and predict)

Plan

Students will:

1. identify a way of testing an idea
2. recognize when they need to do research
3. identify materials to use in testing an idea
4. develop a plan for conducting a "fair test" (fair test—identifying the elements of an experiment that can be different and keeping them all the same, except for the one being tested).

Action

Students will:

1. carry out a plan for testing an idea
2. observe and measure
3. record the results of a plan
4. modify the plan as necessary

Evaluation

Students will:

1. state what they have learned
2. identify where they might be able to use their knowledge
3. identify new questions that arise from the inquiry.

ATTITUDES

Students are expected to:

1. develop an appreciation for science and the scientific endeavour
2. participate in science which will result in strong positive attitudes toward oneself and confidence in oneself as a learner
3. develop an appreciation for the environment and a concern for its stewardship
4. develop an appreciation of science and the role it plays in our lives
5. recognize that science learning is an ongoing process subject to modifications in the future
6. recognize that there are benefits to be reaped from quality workmanship and perseverance
7. develop a joy in learning and a desire to continue science learning.

TECHNOLOGY EMPHASIS

CONCEPTS

Students will:

1. understand that technology can be used to solve practical problems
2. develop an understanding that:
 - science knowledge can sometimes be put to use in technology problem solving
 - some technologies existed before there was an understanding of the scientific principles involved
3. understand that technology includes both products and processes.

TECHNOLOGY PROBLEM-SOLVING SKILLS

Focus of Problem

Students will:

1. identify the problem they want to solve
2. identify the product/process they want to make

Plan

Students will:

1. identify a way to solve the problem
2. recognize when they need to do research
3. identify equipment/supplies required to solve the problem.

Action

Students will

1. carry out a plan for solving a problem
2. modify the plan as necessary.

Evaluation

Students will:

1. demonstrate that the product/process solves the problem
2. identify changes that may improve the product/process
3. identify other uses for the product/process

ATTITUDES

Students are expected to:

1. appreciate that technologies exist to meet needs
2. recognize that technologies may have positive or negative consequences
3. recognize the value of alternate solutions to a problem
4. share the results of their problem solving with others
5. recognize that there are benefits to be reaped from quality workmanship and perseverance
6. demonstrate willingness to participate in the problem-solving process.



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C. CURRICULUM STANDARDS

TOPICS OF STUDY

The program is comprised of four or five units at each grade level. Each unit focuses on a particular science topic, each with its own set of specific learner expectations. It is not required to present these units in a particular order. Certain topics may be suitable to study at particular times of the year or at a time when they may be integrated with other subject areas.

Each of these units has an emphasis on science inquiry or on technology problem solving. **Science inquiry** enables us to learn by observing or experimenting and often requires a "fair test" at some point. For example, science inquiry enables us to understand that light is bent as it passes through glass or plastic. **Technology problem solving** enables us to apply our knowledge to solve a problem or accomplish something, for example, developing a lens that will correct for near-sightedness.

CORE/ELECTIVE COMPONENTS

The program consists of core and elective components. The core program consists of the skills, concepts and attitudes that are to be learned and developed by all elementary school students in Alberta. Seventy to eighty per cent of the total time allotted for science instruction should be devoted to the core component of the program.

The elective component allows teachers to be more flexible in planning their programs to meet student needs and interests and to use local resources. Teachers may select a variety of resources to explore entirely new topics or expand the scope of the prescribed topics. Opportunities exist to integrate science topics with other subject areas. Where this integration involves reading and research it must be directly related to the expectations of the science program.

SCOPE AND SEQUENCE FOR ELEMENTARY GRADES

GRADE	EMPHASIS	TOPIC
1	Science Science Science Technology	Exploration of Liquids Senses Survival Needs of Animals and Plants Building Things
2	Science Science Science Science Technology	Seasonal Changes Hot and Cold and Temperature Growing Plants Testing Building Materials Building with a Variety of Materials
3	Science Science Science Science Technology	Magnetism Hearing and Sound Animal Life Cycles TBA (see page 4 of Response Guide) Building Devices and Vehicles that Move
4	Science Science Science Technology	Observing the Sky Seeing and Light Plant Life Cycles Structures
5	Science Science Science Science Technology	Pond Study Weather Birds Flight Air and Weather Technology
6	Science Science Science Science Technology	Insects and Spiders Classroom Chemistry Forensic Science Electricity and Magnetism Mechanisms Using Electricity

GRADE LEVEL 1

Students will be able to:

GENERAL LEARNER EXPECTATIONS: Science Inquiry

Bring focus to investigative activities based on questions asked by self and by others.

Describe materials and objects that the student has observed and manipulated; identifying what the student did and what the student found out.

RELATED SPECIFIC LEARNER EXPECTATIONS

In the context of the units of study identified for Grade level 1, the student will demonstrate the following science inquiry skills:

1. Focus

- identify the question which is being investigated.

2. Plan

- recognize steps in a plan, and describe what is being done in each step (based on independent activity, on directed activity, and on observing the activity of others).

3. Action

- carry out the identified procedures
- communicate observations orally, and represent those observations through drawing a picture.

4. Evaluation

- explain results (explanations may reflect an early stage of concept development)
- identify new questions that arise from what was learned.

GENERAL LEARNER EXPECTATIONS: Technology Problem Solving

With guidance, use materials provided to create a structure that achieves a given purpose.

RELATED SPECIFIC LEARNER EXPECTATIONS

In the context of the units of study identified for Grade level 1, the student will demonstrate the following technological problem-solving skills:

1. Focus

- identify the purpose (What is to be developed? What is it to do?).

2. Plan

- identify materials that are used
- recognize that the construction involves a sequence of steps, and identify the steps that are being followed.

3. Action

- show readiness to engage in all parts of the task
- demonstrate persistence and confidence in construction tasks.

4. Evaluation

- evaluate the product
- identify how the product might be used.

GENERAL LEARNER EXPECTATIONS: Exploration Of Liquids

Describe the properties of water and other liquids, and recognize water as a component of many living and non-living things.

Describe the interaction of water with different materials, and apply that knowledge to practical problems of liquid containment, transfer, mixing of materials, and separating water from other materials.

RELATED SPECIFIC LEARNER EXPECTATIONS

Students will be able to:

1. Contrast water with other liquids.
2. Identify the three states of liquids.
3. Recognize that water can freeze into ice and melt back into water but the quantity of water remains the same.
4. Recognize that ice can change directly into a gas.
5. Recognize that water boils forming a gas.
6. Recognize that:
 - water will evaporate (but not from a closed container)
 - water can form drops from the air.
7. Recognize that:
 - water can dissolve many things to form a solution
 - substances absorb water at different rates
 - some materials are waterproof and some are not.
8. Distinguish materials that float in water from those that do not.
9. Recognize and appreciate the importance of water to sustaining living things.
10. Recognize and appreciate the need for a clean source of water.

GENERAL LEARNER EXPECTATIONS: Senses

Use a variety of senses in making general and specific observations, and communicate observations through oral language and by producing captioned pictures.

Describe the role of their own senses, and the senses of other living things in enabling perception and action.

RELATED SPECIFIC LEARNER EXPECTATIONS

Students will be able to:

1. Identify and describe each of the senses.
2. Explain what each sense is capable of doing.
3. Determine when it is appropriate to use each of the senses.

4. Gather and process data using each of the senses.
5. Recognize the limitations of our senses and how some people adapt to the loss of a particular sense.
6. Describe how some common animal species use their senses to survive; contrast with the equivalent human senses.
7. Appreciate the importance of the senses to our quality of life.

GENERAL LEARNER EXPECTATIONS: Survival Needs Of Animals And Plants

Describe some common living things and identify needs of those living things.

RELATED SPECIFIC LEARNER EXPECTATIONS

Students will be able to:

1. Classify some common local plants and animals into groups on the basis of visible characteristics, e.g., adaptations for survival (claws, beaks, prickles).
2. Identify the requirements of animals to maintain life, viz. air, food, shelter, water; recognize that we must provide these to animals in our care.
3. Identify the requirements of plants to maintain life, viz. light, temperature, water, growing medium; recognize that we must supply these requirements to plants in our care.
4. Recognize that:
 - most plants require soil to grow in
 - soil is a mixture of many different things.
5. Recognize that certain animals are extinct and explain why the extinction occurred.
6. Explain how some animals rely on plants and how some plants rely on animals.
7. Recognize that some animals (domesticated) need our care and that some are able to live on their own(wild); explain the effect of human domestication on animals.
8. Appreciate and respect the beauty and value of living things.

GENERAL LEARNER EXPECTATIONS: Building Things

Use a variety of different materials in constructing objects, and models of objects.

Identify the purpose of different components of a personally constructed object or model, and identify corresponding components in a related object or model.

RELATED SPECIFIC LEARNER EXPECTATIONS

Students will be able to:

1. Select appropriate materials (paper products, plastic, wood) and design and build a series of structures and toys
 - buildings—homes (human, animal, from other cultures), garages, schools
 - related artifacts for buildings—furniture, equipment
 - toys—models, pop-ups, figures
 - water-related artifacts—dams, waterwheels.
2. Recognize the function of the skeleton (as a structure).
3. Recognize that a product is usually developed in response to a need or a desire.

GRADE LEVEL 2

Students will be able to:

GENERAL LEARNER EXPECTATIONS: Science Inquiry

Work with others to investigate the nature of things, demonstrating understanding of procedures followed, and confidence in ability to learn by direct investigation.

Recognize pattern and order in objects and events studied and, with guidance, record procedures and observations using pictures and words.

Make predictions and generalizations based on observations made.

RELATED SPECIFIC LEARNER EXPECTATIONS

In the context of the units of study identified for Grade level 2, the student will demonstrate the following science inquiry skills:

1. Focus

- identify the question which is being investigated
- identify one or more possible answers to the question.

2. Plan

- identify materials to be used and how they will be used
- identify procedures to be followed
- with guidance, use print and other sources of information provided by teacher.

3. Action

- carry out the identified procedures
- collect data through direct observation and manipulation of materials
- communicate observations orally and through captioned pictures.

4. Evaluation

- explain results in terms of cause and effect (explanations of causation may reflect an early stage of concept development)
- identify possible applications of what was learned
- identify new questions that arise from what was learned.

GENERAL LEARNER EXPECTATIONS: Technology Problem Solving

With guidance, work independently or with others in constructing objects based on a given design, and construct variations of the design.

RELATED SPECIFIC LEARNER EXPECTATIONS

In the context of the units of study identified for Grade level 2, the student will demonstrate the following technological problem-solving skills:

1. Focus

- identify the purpose (What is to be developed? What is it to do?).

2. Plan

- identify materials to be used, and how they are used
- identify the steps followed in construction of an object
- with guidance, use print and other sources of information and ideas provided by teacher.

3. Action

- show readiness to engage in all parts of the task, and to allow others to make their contribution
- demonstrate persistence and confidence in construction tasks
- communicate with others regarding steps in construction.

4. Evaluation

- evaluate the product and identify possible improvements
- identify new applications.

GENERAL LEARNER EXPECTATIONS: Seasonal Changes

Describe seasonal changes, and interpret the effects of seasonal changes on living and non-living things.

RELATED SPECIFIC LEARNER EXPECTATIONS

Students will be able to:

1. Identify the regular and predictable cycle of the seasons; recognize that each season's weather tends to be similar year after year.
2. Identify the common forms of precipitation which are typical of local seasons.
3. Record observable seasonal changes over a period of time.
4. Identify the changes that occur in plants and animals as the seasons change.

GENERAL LEARNER EXPECTATIONS: Hot & Cold & Temperature

Recognize effects of heating and cooling, and identify methods for heating and cooling.

RELATED SPECIFIC LEARNER EXPECTATIONS,

Students will be able to:

1. Describe heat in relative terms—hotter than, colder than.
2. Measure temperature in degrees Celsius (°C).
3. Describe how heating and cooling materials can often change them.
4. Recognize that the body temperature of most people is nearly the same.
5. Recognize that hot water or hot air is the method by which most homes and apartments are heated; identify the mechanism that provides this heat.
6. Demonstrate the regulation of temperature in a home by manipulating a thermostat.
7. Recognize the role of insulation in keeping things hot or cold.
8. Appreciate the degree to which our way of life in Alberta is affected by the temperature.

GENERAL LEARNER EXPECTATIONS: Growing Plants

Describe the appearance and life cycles of some common plants, and identify adaptations to different environments.

Identify requirements for plant growth and demonstrate confidence in nurturing a plant.

Compare and demonstrate how, in addition to seeds, some common plants propagate themselves.

RELATED SPECIFIC LEARNER EXPECTATIONS

Students will be able to:

1. Classify some common plants into groups on the basis of visible characteristics or how we use them.
2. Identify the requirements of plants to maintain life, viz. air, light, temperature, water, growing medium; recognize that we must supply these requirements to plants in our care.
3. Recognize that plants go through a life cycle.
4. Recognize adaptations that make certain plants suited for certain environments.
5. Recognize that:
 - most plants require soil to grow in
 - soil is a mixture of many different things.
6. Recognize that:
 - plants reproduce themselves in a variety of ways
 - plants of the same kind go through a similar life cycle
 - offspring are much like their parents.
7. Appreciate and recognize the importance of plants as a food source to humans.

GENERAL LEARNER EXPECTATIONS: Testing Building Materials

Evaluate the suitability of different materials for use in a building task.

Students will be able to:

1. Describe the distinctive properties of some common solids such as wood, paper and plastic that make them suitable for use as building materials.
2. Develop procedures which test the suitability of wood, paper and plastic for various building tasks.
3. Understand the safety concerns involved in choosing materials to use for various building tasks.

GENERAL LEARNER EXPECTATIONS: Building With A Variety of Materials

Work cooperatively to construct a number of structures and artifacts based upon identified needs and opportunities.

Students will be able to:

1. Select, and safely use, wood, paper and plastic for various building tasks based upon their properties and characteristics; defend the choice of each in the various building situations.
2. Understand and use a variety of methods to join or fasten materials.
3. Identify materials that are natural or manufactured.
4. Design and construct a device to keep something hot or cold.
5. Recognize that specific tools are suitable for different materials and use them safely and appropriately.
6. Know how to maintain and store tools.
7. Recognize and appreciate the importance of quality workmanship in building something.
8. Recognize that clearly articulating a need helps to define the design of the final product.

GRADE LEVEL 3

Students will be able to:

GENERAL LEARNER EXPECTATIONS: Science Inquiry

Work independently or with others in investigating the nature of things, demonstrating purposeful action leading to observations and inferences.

Identify patterns and order in objects and events studied, and with guidance, record observations through pictures, words and charts (with guidance on the construction of charts), and make predictions and generalizations based on those observations.

RELATED SPECIFIC LEARNER EXPECTATIONS

In the context of the units of study identified for Grade level 3, the student will demonstrate the following science inquiry skills:

- 1. Focus**
 - identify the question which is being investigated
 - identify one or more possible answers to the question (by stating a hypothesis or a prediction).
- 2. Plan**
 - with guidance identify sources for information and ideas, and access information and ideas from those sources
 - identify materials to be used and how they will be used
 - identify procedures to be followed.
- 3. Action**
 - work independently or with others to carry out the identified procedures
 - record observations and measurements accurately using captioned pictures and charts (with guidance in the construction of charts).
- 4. Evaluation**
 - state an inference based on observations (inference will identify cause and effect relationship that is supported by observations)
 - identify possible applications of what was learned
 - identify new questions that arise from what was learned.

GENERAL LEARNER EXPECTATIONS: Technology Problem Solving

Work individually or with other students to make a structure or mechanical device that achieves a given purpose.

RELATED SPECIFIC LEARNER EXPECTATIONS

In the context of the units of study identified for Grade level 3, the student will demonstrate the following technological problem-solving skills:

- 1. Focus**
 - identify the purpose (What is to be developed? What is to do?).

2. Plan

- with guidance, identify sources for information and ideas, and access information and ideas from these sources
- identify materials that might be used, and how they might be used
- identify possible steps that might be used in completing the task (identify sub tasks and sequence).

3. Action

- show readiness to engage in all parts of the task, and to allow others to make their contribution
- demonstrate persistence and confidence in construction tasks
- communicate with others, regarding the purpose or each step being followed.

4. Evaluation

- evaluate the product and identify possible improvements
- identify new applications.

GENERAL LEARNER EXPECTATIONS: Magnetism

Describe the interaction of magnets with other magnets, and with common materials.

RELATED SPECIFIC LEARNER EXPECTATIONS

Students will be able to:

1. Identify where magnets are used in the child's environment.
2. Distinguish materials that are attracted by a magnet from those that are not.
3. Recognize that magnets have polarity; demonstrate that certain poles repel and some attract.
4. Recognize that magnets attract materials with iron or steel in them.
5. Design and produce a device or artifact that uses a magnet.

GENERAL LEARNER EXPECTATIONS: Hearing and Sound

Describe and demonstrate ways sound is generated and pitch is varied.

RELATED SPECIFIC LEARNER EXPECTATIONS

Students will be able to:

1. Identify the ear as part of a system that enables humans to hear sound.
2. Identify a vibration as the source of sound.
3. Recognize that:
 - pitch is caused by the rate of vibration;
 - some pitches are too high for the human ear to hear.
4. Recognize that:
 - loudness is caused by the force of the vibration;
 - very loud noises can be harmful.
5. Demonstrate that sound can travel through solids, liquids and gasses.

6. Recognize that certain sounds have characteristics that cause people to interpret them as pleasant or unpleasant.
7. Understand and appreciate the role that sound plays in communication.

GENERAL LEARNER EXPECTATIONS: Animal Life Cycles

Describe the appearance and life cycles of some common animals, and identify adaptations to different environments.

Identify requirements for animal care.

RELATED SPECIFIC LEARNER EXPECTATIONS

Students will be able to:

1. Understand that all animals need to reproduce themselves.
2. Recognize that the offspring of animals generally grow up to look like their parents.
3. Explain the concept of a life cycle.
4. Compare and contrast the life cycle of a common mammal, fish, insect, and amphibian.
5. Observe and compare living examples of at least one of mammals, fish, insects, or amphibians through more than one stage of their life cycle (e.g., mealworms, tadpoles, worms, guppies, butterflies/moths, gerbils, isopods, brine shrimp, etc.).
6. Compare and contrast the life cycles of plants and animals.
7. Recognize the role of decay in the life cycle of living things.
8. Appreciate and respect the ability of living things to replenish their numbers.
9. Provide the care necessary to sustain the animals in their care.

GENERAL LEARNER EXPECTATIONS: TBA

RELATED SPECIFIC LEARNER EXPECTATIONS

Students will be able to:

- 1.

GENERAL LEARNER EXPECTATIONS: Building Devices and Vehicles That Move

Construct a mechanical or magnetic device for a designated purpose, using materials and design suggestions provided. (One or more components of the task will be open ended and require the student to determine the specific procedure to be followed.)

Explore and evaluate variations to the design of a mechanical device, demonstrating that control is an important element in the design and construction of that device.

RELATED SPECIFIC LEARNER EXPECTATIONS

Students will be able to:

1. Design and construct devices and vehicles that move or have moving parts (linkages, wheels and axles).
2. Use simple hand-operated mechanisms to transmit motion.
3. Design and construct devices and vehicles that employ an energy-storing device to cause motion (elastic band, motor).
4. Explain that moving from place to place requires time, and that the shorter the time the faster the movement was.
5. Design and construct devices that produce sound/music.
6. Appreciate the value of a simple design.
7. Recognize the role of safety in developing a good product.
8. Recognize the value of using simple materials to construct artifacts.

GRADE LEVEL 4

Students will be able to:

GENERAL LEARNER EXPECTATIONS: Science Inquiry

Work independently or with others in investigating the nature of things, demonstrating purposeful action leading to inferences supported by observations.

Identify patterns and order in objects and events studied, and with guidance, record observations through pictures, words and charts, and make predictions and generalizations based on those observations.

RELATED SPECIFIC LEARNER EXPECTATIONS

In the context of the units of study identified for Grade level 4, the student will demonstrate the following science inquiry skills:

1. Focus

- identify the question which is being investigated
- identify one or more possible answers to the question (by stating a hypothesis or a prediction).

2. Plan

- identify sources for information and ideas, and access information and ideas from these sources
- identify materials to be used and how they will be used
- identify procedures to be followed
- with guidance, select procedures that comprise a “fair test”.

3. Action

- work cooperatively with others in carrying out the identified procedures
- record observations and measurements accurately using captioned pictures and charts (with guidance in the construction of charts).

4. Evaluation

- state an inference based on observations (inference will identify cause and effect relationship that is supported by observations)
- recognize procedures that are not appropriate to a “fair test”
- identify possible applications of what was learned
- identify new questions that arise from what was learned.

GENERAL LEARNER EXPECTATIONS: Technology Problem Solving

Work independently or with others in designing and carrying out an investigation of a practical problem and developing a possible solution, (given a problem that involves creating a structure, that can be built with materials that are available to the student).

RELATED SPECIFIC LEARNER EXPECTATIONS

In the context of the units of study identified for Grade level 4, the student will demonstrate the following technological problem-solving skills:

1. **Focus**
 - identify the purpose of the structure.
2. **Plan**
 - identify sources for information and ideas, and demonstrate skill in accessing them
 - work independently or with others to identify a general approach to the task
 - identify materials that might be used, and how they might be used
 - identify ways a team could work together to complete the task.
3. **Action**
 - show readiness to engage in all parts of the task, and to allow others to make their contribution
 - demonstrate persistence and confidence in construction tasks
 - demonstrate readiness and ability to modify a procedure when needed (troubleshooting)
 - communicate with group members, showing ability to both contribute and receive ideas.
4. **Evaluation**
 - evaluate the design and identify possible improvements
 - identify new applications.

GENERAL LEARNER EXPECTATIONS: Observing the Sky

Observe, describe and interpret the movement of objects in the night sky, and identify pattern and order in those movements.

RELATED SPECIFIC LEARNER EXPECTATIONS

Students will be able to:

1. Recognize that the Sun appears only during the day while the Moon can sometimes appear in both the day and night.
2. Describe the positional changes of the Sun, stars and Moon in the sky
3. Demonstrate solar and lunar eclipses.
4. Demonstrate that:
 - the Sun casts shadows
 - the Sun's shadow changes throughout the day
 - the Sun's shadow differs at a set time of day from month to month.
5. Describe the regular 24-hour cycle of day and night; recognize that the length of the day changes in a regular and predictable cycle.
6. Record cloud types and cloud patterns over a period of time.
7. Contrast the phases of the Moon and illustrate the shape of the Moon as it changes.
8. Recognize that the Moon's phases are regular and predictable and that the shapes are repeated in a regular cycle.
9. Identify features on the surface of the Moon.
10. Recognize that the Moon reflects sunlight.

GENERAL LEARNER EXPECTATIONS: Seeing and Light

Identify sources of light, describe evidence of its travel and transmission, and describe applications to technological devices and vision.

RELATED SPECIFIC LEARNER EXPECTATIONS

Students will be able to:

1. Recognize that the eye is part of a system that enables humans to see light.
2. Identify the Sun as the primary source of light and understand that one should not observe the Sun directly without proper eye protection (#14 Welding Filter).
3. Compare other sources of light, including electric light bulbs of all sorts plus objects that burn.
4. Distinguish objects that reflect light from objects that emit their own light.
5. Explain that shadows result when light is blocked.
6. Recognize that light is usually accompanied by heat.
7. Recognize that light can be broken into colours and that different colours of light can be combined to form a new colour.
8. Contrast the properties of materials regarding their ability to allow light to pass through them.
9. Recognize that light travels in straight lines unless it is interrupted.
10. Recognize that: light can be bent (refracted); vision can be corrected by bending light.
11. Identify the role of sunlight in food chains.
12. Demonstrate the ability to employ a technology that uses or manipulates light (camera or pin hole camera, light-sensitive paper, camcorder, VCR, telescope, microscope, optical fibre).

GENERAL LEARNER EXPECTATIONS: Plant Life Cycles

Demonstrate knowledge and skills for the study, interpretation, propagation and enhancement of plant growth.

RELATED SPECIFIC LEARNER EXPECTATIONS

Students will be able to:

1. Recognize that:
 - plants reproduce themselves in a variety of ways
 - plants of the same kind go through a similar life cycle
 - offspring are much like their parents.
2. Identify the light, temperature, water, and growing medium requirements of the *Brassica rapa* plant.
3. Provide the care required to maintain the Brassica plant through a complete life cycle, collecting the seeds necessary for another generation of plants.
4. Identify the life stages of the Brassica plant.
5. Identify the reproductive structures of the Brassica plant.
6. Distinguish the adaptive features that the Brassica plant has developed in response to its environment.

7. Compare and contrast with animal life cycles.
8. Understand and appreciate why a plant that will go through its life cycle in approximately 30 days is so valuable for scientific study.

GENERAL LEARNER EXPECTATIONS: Structures

Construct structures, using a variety of materials and designs, and compare the effectiveness of the various materials and designs for the intended purpose.

RELATED SPECIFIC LEARNER EXPECTATIONS

Students will be able to:

1. Recognize and value the variety of structures that exist in the natural world; describe the function of those structures (e.g., beaver dams, birds nests, spider webs, plant roots).
2. Design, construct and test structures that are intended to support objects and span gaps.
3. Use a variety of materials and techniques to build structures.
4. Recognize, and include in the design, an understanding that the safety of a structure is compromised if it becomes unstable.
5. Recognize and appreciate how a simple design can be valuable in terms of time and expenses.
6. Recognize and appreciate the value of good workmanship.

GRADE LEVEL 5

Students will be able to:

GENERAL LEARNER EXPECTATIONS: Science Inquiry

Work cooperatively with others to design and carry out an investigation that comprises a fair test (involving objects and events that are within the student's direct experience, and based on an idea about those objects or events that is accessible to direct investigation by the student).

Recognize the importance of accuracy in observation and measurement, and with guidance, apply suitable methods to record, compile and interpret observations and measurements gathered by self and group.

RELATED SPECIFIC LEARNER EXPECTATIONS

In the context of the units of study identified for Grade level 5, the student will demonstrate the following science inquiry skills:

1. Focus

- identify the question which is being investigated
- identify one or more possible answers to their questions (by stating a hypothesis or a prediction).

2. Plan

- identify sources for information and ideas, and demonstrate skill in accessing these sources
- identify a way of testing the idea
- identify procedures to be followed
- identify variables that need to be held constant to ensure a fair test.

3. Action

- work individually or with others in following the procedures (procedures developed by student(s), or presented by the teacher)
- record observations and measurements accurately
- modify the plan as necessary.

4. Evaluation

- evaluate how well the procedures worked, and identify possible improvements
- state an inference based on observations
- identify possible applications of what was learned
- identify new questions that arise from what was learned.

GENERAL LEARNER EXPECTATIONS: Technology Problem Solving

Work cooperatively with other students in designing and carrying out an investigation of a practical problem and developing a possible solution, (given a problem that involves construction or modification of a vehicle or device).

RELATED SPECIFIC LEARNER EXPECTATIONS

In the context of the units of study identified for Grade level 5, the student will demonstrate the following technological problem-solving skills:

1. Focus

- identify the purpose of the device (What performance is expected? What kind of control is required?).

2. Plan

- identify sources for information and ideas, and demonstrate skill in accessing these sources
- work cooperatively with others to identify a general approach to the task
- identify materials that might be used, and how they might be used
- identify possible steps that might be used in completing the task
- identify ways a team could work together to complete the task.

3. Action

- show readiness to engage in all parts of the task, and to allow others to make their contribution
- demonstrate persistence and confidence in construction tasks
- demonstrate readiness and ability to modify a procedure when needed (troubleshooting)
- demonstrate readiness and skill in communicating ideas with group members, including listening, speaking, gesture, drawing and creating of models.

4. Evaluation

- evaluate the product or process developed and identify possible improvements
- evaluate the procedures used, and identify possible improvements
- identify new applications.

GENERAL LEARNER EXPECTATIONS: Pond Study

Describe the living and non-living components of a pond water community and the interactions within and among them.

RELATED SPECIFIC LEARNER EXPECTATIONS

Students will be able to:

1. Understand that a pond community consists of living and non-living things, both in and outside the water.

2. Identify by name some of the common plants and animals found at a pond site, both in and around the water.
3. Recognize adaptations that make certain plants and animals suited for pond life.
4. Understand and appreciate that all animals and plants, not just the large ones, have an important role in the pond environment.
5. Distinguish animals as consumers (can be predator and/or prey) from plants as producers.
6. Distinguish plants that are primary producers (make their own food using light) from plants that are not (decomposers); recognize that plants are essential to all other life forms.
7. Identify food chains and food webs in a pond and be able to place plants in their proper place in the chain or web.
8. Understand that animals extract oxygen from air and water and identify examples of each.
9. Recognize that humans have an effect on the environment and can change it.
10. Recognize that a change within an environment can effect the whole environment.
11. Identify some birds that live on or near a pond.

GENERAL LEARNER EXPECTATIONS: Weather

Observe, describe and interpret weather phenomena, and identify effects of the weather.

Demonstrate skill in investigating and evaluating different preparations for weather.

RELATED SPECIFIC LEARNER EXPECTATIONS

Students will be able to:

1. Identify the regular and predictable cycle of the seasons; recognize that the weather in each season tends to be similar.
2. Identify rain, hail, sleet and snow as the common forms of precipitation; recognize that certain types of precipitation are typical of different climates.
3. Identify moving air as wind.
4. Record weather over a period of time.
5. Identify some common types of clouds and relate them to weather patterns.
6. Demonstrate that different surfaces on the face of the Earth retain and release heat at different rates.
7. Demonstrate the effect of exposing metals and other materials to the weather.
8. Predict and measure weather (temperature, humidity, air pressure) using some relatively simple meteorological instruments.
9. Interpret climate as the total of the weather in a particular region; recognize that climate varies throughout the world.
10. Test fabrics to choose ones that will most effectively meet the challenges of different weather conditions (e.g., warmth, waterproof, windproof).

GENERAL LEARNER EXPECTATIONS: Birds

Describe the general structure, life cycle, and life habits of birds, and use this knowledge in interpreting local species that the student has observed.

RELATED SPECIFIC LEARNER EXPECTATIONS

Students will be able to:

1. Identify by sight at least five local birds in their natural surroundings and become knowledgeable about their:
 - food
 - nests
 - eggs
 - colouration.
2. Recognize adaptations that make birds suited for flight.
3. Dissect an owl pellet and explain the food chain represented by the contents.
4. Infer the relationship between a bird's beak and feet and its environment.
5. Describe the flight patterns of different birds.
6. Record the distinctive calls of some local birds and identify the bird by its call.
7. Explain migration and contrast birds that migrate with those that do not.

GENERAL LEARNER EXPECTATIONS: Flight

Describe the interaction of air and objects in flight, and identify adaptations for controlling flight.

RELATED SPECIFIC LEARNER EXPECTATIONS

Students will be able to:

1. Demonstrate Bournelli's principle and use it explain how airplanes and kites develop lift.
2. Design and test a variety of parachute shapes and sizes.
3. Design and test a hot air balloon.
4. Test glider designs to make one which will go the farthest or stay up the longest.
5. Explore the concept of control surfaces which provide stability to aircraft (powered and not) and rockets.
6. Recognize and measure air as having mass, occupying space and exerting pressure and being able to support aircraft in flight.
7. Identify adaptations that enable birds and insects to fly.
8. Demonstrate an understanding that control is vital to all air vehicles and must be an integral part of the design process.
9. Identify gravity as a force pulling air vehicles down to the Earth.

GENERAL LEARNER EXPECTATIONS: Air and Weather Technology

Construct devices that move air, measure air or through which air moves.

RELATED SPECIFIC LEARNER EXPECTATIONS

Students will be able to:

1. Design and construct devices or vehicles that rely on air to function
 - air vehicles—gliders, airplanes, parachutes, rockets
 - air measuring devices—anemometers, barometers, wind vanes
 - air devices—pneumatic devices, air cannons.
2. Design and construct clothing models intended to meet the requirements of different types of weather.
3. Appreciate how important it is to be able to forecast weather and to have suitable clothing to endure various types of weather.

GRADE LEVEL 6

Students will be able to:

GENERAL LEARNER EXPECTATIONS: Science Inquiry

Work cooperatively with others to design and carry out a controlled investigation (involving objects and events that are within the student's direct experience, and based on an idea about those objects or events that is accessible to direct investigation by the student).

Recognize the importance of accuracy in observation and measurement, and apply suitable methods to record, compile, interpret, and evaluate observations and measurements gathered by self and group.

RELATED SPECIFIC LEARNER EXPECTATIONS

In the context of the units of study identified for Grade level 6, the student will demonstrate the following science inquiry skills:

1. Focus

- identify the question which is being investigated
- identify one or more possible answers to their questions (by stating a hypothesis or a prediction).

2. Plan

- identify sources for information and ideas, and demonstrate skill in accessing them
- identify a way of testing the idea
- identify procedures to be followed
- identify variables that are important to the procedures:
 - identify what will be varied
 - identify what will be held constant (controls or control variables)
 - identify what is to be observed to find out how it changes.

3. Action

- work cooperatively with others to carry out the procedures (procedures developed by student(s), or presented by the teacher)
- record observations and measurements accurately
- modify the plan as necessary.

4. Evaluation

- consider alternate explanations for observations
- state an inference which explains observations
- identify possible applications of what was learned
- identify new questions that arise from what was learned
- evaluate how well the procedures worked, and identify possible improvements.

GENERAL LEARNER EXPECTATIONS: Technology Problem Solving

Work cooperatively with other students in designing and carrying out an investigation of a practical problem and developing a possible solution, (given a problem that involves use or construction of a mechanical device with electrical components).

RELATED SPECIFIC LEARNER EXPECTATIONS

In the context of the units of study identified for Grade level 6, the student will demonstrate the following technological problem-solving skills:

- 1. Focus**
 - identify the problem that is to be solved.
- 2. Plan**
 - identify sources for information and ideas, and demonstrate skill in accessing them
 - work cooperatively with others in identifying alternative designs and approaches to construction, and select one or more alternatives to try
 - identify steps that will be used in completing the task (identify subtasks and sequence)
 - identify ways a team could work together to complete the task.
- 3. Action**
 - show readiness to engage in all parts of the task, and to allow others to make their contribution
 - demonstrate persistence and confidence in construction tasks
 - demonstrate readiness and ability to modify a procedure when needed (troubleshooting)
 - demonstrate readiness and skill in communicating ideas with group members, including listening, speaking, gesture, drawing and creating of models.
- 4. Evaluation**
 - evaluate the product or process developed and identify possible improvements
 - evaluate the procedures used, and identify possible improvements
 - identify new applications.

GENERAL LEARNER EXPECTATIONS: Insects and Spiders

Describe the general structure, life cycle, and life habits of insects and spiders, and apply this knowledge in interpreting local species that the student has observed.

RELATED SPECIFIC LEARNER EXPECTATIONS

Students will be able to:

1. Compare and contrast spiders and insects.
2. Recognize adaptations that make specific spiders and insects suited for their environment.
3. Recognize the vast diversity of spiders and insects.
4. Identify the prey and predator relationship of spiders and insects.
5. Maintain an insect or a spider through a complete life cycle.

GENERAL LEARNER EXPECTATIONS: Classroom Chemistry

Describe the properties and interactions of various household liquids and solids, and interpret their interactions.

RELATED SPECIFIC LEARNER EXPECTATIONS

Students will be able to:

1. Describe substances that can be broken down and then recovered to their original form.
2. Contrast a mixture and a solution.
3. Apply and evaluate a variety of techniques for separating materials where one of the components is a liquid and one is a solid.
4. Describe procedures for creating solutions.
5. Recognize that the surface of a liquid has distinctive properties, and describe the interaction of water with other liquids and solids.
6. Distinguish substances that will dissolve in a liquid from those that will not; identify some substances that can be recovered to their original form and some that cannot.
7. Identify a chemical reaction; explain how the products of a reaction differ from the substances that were combined to result in the reaction.
8. Produce carbon dioxide gas through the interaction of solids and liquids and demonstrate that it is different from ordinary air.
9. Use an indicator to identify a solution as being acidic, basic or neutral.
10. Demonstrate a procedure for creating a crystal.

GENERAL LEARNER EXPECTATIONS: Forensic Science

Apply observation and inference skills to distinguish a specific pattern from among a group of similar patterns.

Apply a knowledge of the properties and interactions of materials to the investigation and identification of a material sample.

RELATED SPECIFIC LEARNER EXPECTATIONS

Students will be able to:

1. Develop an understanding that evidence collected during the investigation of a crime may have unique characteristics that allow the investigator to make inferences about the events linked to that crime.
2. Investigate the following types of forensic evidence and link them to a suspected crime by:
 - classifying fingerprints collected from a variety of surfaces
 - classifying footprints and soil samples from a variety of locations
 - contrasting some brands of pens using paper chromatography.
 - analyzing handwriting samples to identify the handwriting of a specific person
 - identifying specimens of fabric by comparing them to standard samples.

GENERAL LEARNER EXPECTATIONS: Electricity and Magnetism

Demonstrate safe methods for the study of magnetism and electricity, identify methods for measurement and control, and apply techniques for evaluating magnetic and electrical properties of materials.

RELATED SPECIFIC LEARNER EXPECTATIONS

Students will be able to:

1. Explain how electricity, as an energy source, is essential to the maintenance of our way of life (part of the popularity of electricity is that it can be sent long distances).
2. Explain how:
 - electricity and magnetism are related
 - magnets are used to generate electricity
 - electricity can be used to create magnetism.
3. Demonstrate that electricity can be generated directly from sunlight.
4. Contrast the difference types of electricity:
 - wall plug in (alternating current), dangerous and should not be experimented with
 - battery (direct current), generally safe
 - static, generally safe.
5. Recognize and appreciate the potential danger involved in using household electrical current.
6. Demonstrate the flow of electricity through a circuit.
7. Identify conductors (allow electricity to flow through them) and insulators (do not allow the flow of electricity through them).
8. Interpret and explain:
 - an electrical meter and a utility bill
 - the consumption units for electricity, water and gas in our homes or schools
 - the relationship of water, gas and electricity consumption to the changing seasons of the year.
9. Interpret efficiency labels on electrical appliances.
10. Evaluate the environmental consequences of generating electricity by burning fossil fuels (the most common form of electrical generation in Alberta).

GENERAL LEARNER EXPECTATIONS: Mechanisms using Electricity

Construct simple circuits, and apply an understanding of circuits to the construction and control of motorized devices.

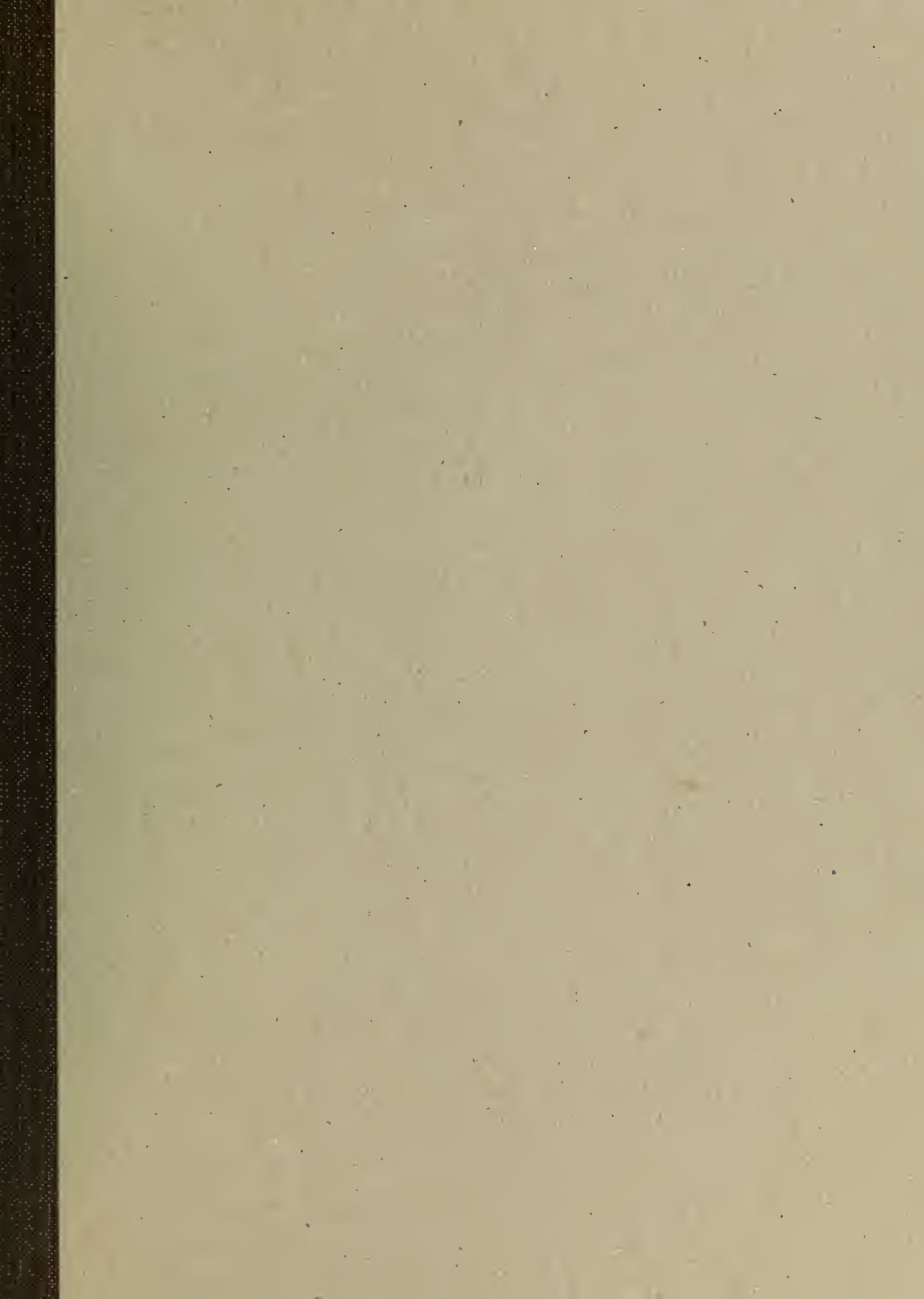
RELATED SPECIFIC LEARNER EXPECTATIONS

Students will be able to:

1. Design and construct structures that use electrical devices.
2. Design and construct toys or vehicles that use a battery powered electric motor to produce motion.
3. Design and construct a burglar alarm.
4. Recognize the importance of control mechanisms in the design and construction of electrical devices.
5. Appreciate the importance of aesthetics in the design process.

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